NEW CENTURY

Computer Science

Practical Note Book

For Class ICS

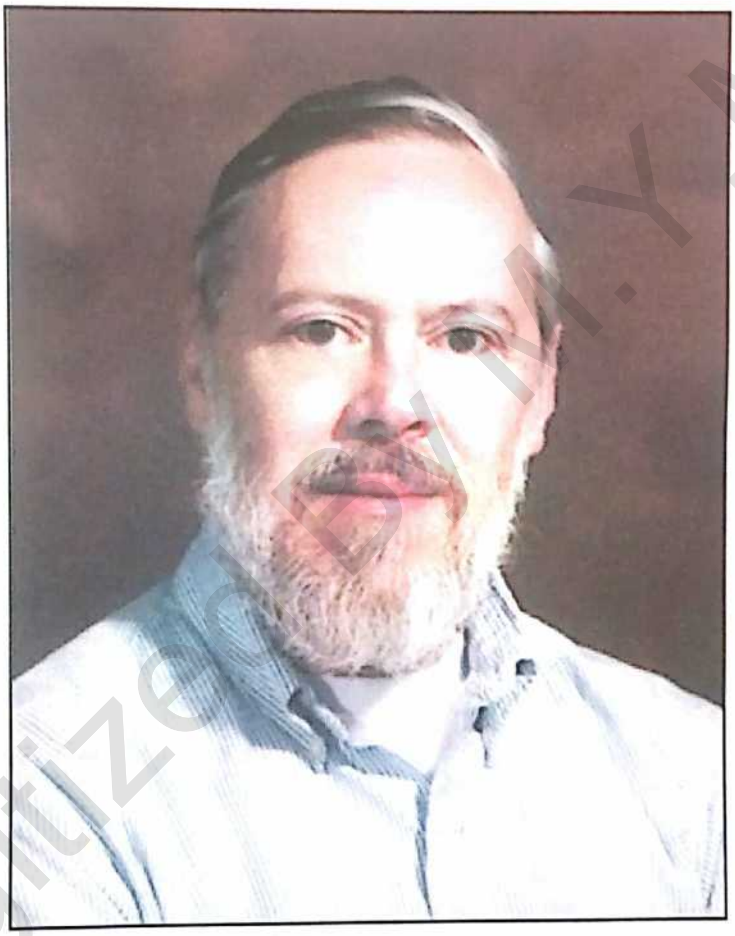
Part - II

Written by:
Syed Zaffar Iqbal

New College Publications
Archer Road Quetta

Part B

PART B



Dennis Ritchie

C LANGUAGE

Objective for C Language

Before you start programming in C language, you must review all the basic concepts of programming in C. It is important to plan your program better before you begin.

What is program?

A well-define set of instructions given to computer is called program. A computer program is written in a programming language.

What is language?

Language is a way of communication. A characteristic style of speech or writing that interacts between two mediums that is user and machine. A set of characters convention and rules that is used for conveying information is called Language.

What is programming?

Programming is the process of writing computer based programs or software. Creating of a computer program is called programming.

What is programmer?

A person who does computer programming & develops computer software are called programmer.

What is programming language?

A set of words and symbols used to write a computer program is called programming language. The programming languages are used to write computer program. A programming language is a means of communication between a user and computer. In other words programming language is a complex synthetic mechanism which provides some special features to build/develop any program/software are called programming language.

What are the types of programming languages?

There are two major types of computer programming languages

- Low Level Languages
- High Level Languages

What is low-level language?

A low level language that is very closer to the computer hardware. The term low level means closeness to the way in which the machine has been built. Low levels languages are machine oriented and required extensive knowledge of computer hardware and its configuration.

What are the types of low-level languages?

The low level languages are divided into

- Machine language and

- Assembly language

What is machine language?

A type of language in which instructions are written in binary form (0-1) called machine language. It is the only language that is directly understood by the computer. It doesn't need any translator program. We also called it machine code and it is written as string of binary (1s or 0s).

What is assembly language?

A programming language that is one step away from machine language means to say that it is first step to improve the programming structure. In assembly language, machine instructions are replaced with English-like word called mnemonics. It is pronounced as Ne-Monics. Assembly language is requiring translating program to translate assembly language into machine language. The translator program is called assembler.

What is high-level language?

A high-level programming language is a programming language with strong abstraction from the details of the computer. Such languages are considered high-level because they are closer to human languages and from machine languages. In high-level languages you cannot directly interact with the hardware. There are different types of high-level languages, such as BASIC, FORTRAN, COBOL, VB, Pascal, ALGOL, Ada, C language etc.

What are the commonly use high-level languages?

Commonly Used High-Level Languages are:

COBOL: Stands for COmmon Business Oriented Language; it is specially designed for business applications.

BASIC: Stands for Beginner All Purpose Symbolic Instruction Code. It was used mainly by students to use the computer for solving simple problems.

FORTRAN: Stands for FORmula TRANslation. It has very powerful mathematical capabilities.

Pascal: It is used for both sciencetific and business applications.

Java: It provide strong feature for network programming.

C/C++: It is used to write system software and application software.

What are the advantages of high-level languages?

Some important characteristics or advantages of high-level languages are as follows:

- Easy to learn
- Easy error detection
- Standardized syntax
- Deep hardware knowledge not required
- Machine independence
- More programmers
- Shorter programs

What is the difference between low-level and high-level languages?

Low-level languages are difficult but the high-level languages are easy. Low-level languages provide more hardware support than high-level languages. The programs written in low-level languages are faster than high-level languages.

What are the language processors (translators)?

The language processors or translators are software that converts programs into machine language. Every computer language has its own translator. There are three types of the processors or translators. These are assembler, interpreter and compiler.

What are the types of language processors (translators)?

There are three types of language processors

- Assembler
- Compiler
- Interpreter

What is assembler?

A program that translates assembly language instructions into machine language instructions is called assembler.

What is interpreter?

An interpreter is a program that converts the instruction of a high-level language into machine language by one statement at a time. A program written in high-level language is called source program. Interpreter also checks syntax errors in program. Interpreter can check the program line by line if there is any error in the program than interpreter terminates the program and show the error. It means interpreter can check the program line by line. Java, Basic and Visual basic use interpreter.

What is compiler?

A compiler is a program that converts the instruction of a high-level language into machine language as a whole. A program written in high-level language is called source program. The compiler converts the source program into machine code. The machine code program is called object program. The object program can executed many times. Compiler also checks syntax errors in program. Compiler can check the entire program if there are some errors in the whole program than it can show all the possible errors in the program. It means compiler can check the program at whole. COBOL, FORTRAN, C, C++ use compiler.

What is a linker?

A program that combines the object program with additional library files is called linker. It is a part of compiler. It combines object program and library files and saves the final machine language program as executable file. The extensive of executable files is .exe.

What is the difference between compiler and interpreter?

The main difference between compiler and interpreter is that compiler converts a program into machine code as a whole and interpreter converts a program into machine code statement by statement.

What is source code?

Source code is a computer program written in a high-level programming language like C, C++, Visual Basic or Java. Computer cannot understand the statements of high-level language. The source code cannot be executed by directly. It is converted into machine code and then executed.

What is object code?

An object code is the program that is translated by a language processor. It is also called machine code. Computer understands object code directly.

What is difference between source code and object code?

Source code is easy to understand and modify. Object code is difficult to understand and modify. Source code contains fewer statements than object code.

What is a structured programming language?

In structured programming languages, the entire logic of the program is divided into number of smaller modules or function. Each module is a piece of code that implements a different functionality. The main module calls other modules when they are needed execute.

What is an unstructured programming language?

In unstructured programming languages, the entire logic of the program is implemented in a single module of function. The programs written in these languages are error prone, difficult to understand, modify and debug.

What is error?

In programming incorrectly written code is called error.

What are the types of errors?

Usually intentional there are three types of errors.

- Syntax error
- Logical error
- Run-time error

What is syntax?

A collection of rules for writing program in a programming language is called syntax.

What is syntax error?

Syntax error is a type of error that occurs when an invalid statement is written in program. Syntax means any spelling error or any typing error, because programmer can mention wrong spelling for the same code so it calls syntax error.

What is logical error?

A type of error that occurs due to poor logic of the programmer is called as logical error. A logical error occurs when the program follows a faulty algorithm. A statement with logical error may produce unexpected and wrong result.

What is run-time error?

A type of error that occurs during the execution of program is called run-time error. It is caused when a statement directs the computer to execute an illegal operation such as dividing a number by zero.

What is the testing and debugging?

When any software company completes any software, after completion of the same testing department can check all the software according to the user requirements to make software free of errors. For this purposes he can check/test all the software thoroughly, separately all modules of the software and if found any error in the software then correct them. Phase in which team checks software called Testing and the phase where a team correct error is called Debugging. So this all procedure called testing and debugging.

What is a bug?

A small programming error is called bug. A computer bug is an error, fault, flaw, mistake or failure in a computer program that prevents (stop) it from working correctly or produces an incorrect result. Bugs arise from mistakes and errors made by programmer.

What is a debugging?

Debugging is a logical process of finding and reducing the number of bugs. The process of finding and removing bugs is called debugging.

What is the history chart of C language?

Year	Language Development
1960	ALGOL 60
1963	CPL
1967	BCPL
1970	B
1972	C

What is the purpose of the statement #include<stdio.h> in a C program?

The purpose of #include<stdio.h> is include usually the standard device input/output is your keyboard and the standard output device a terminal which is displayed on your monitor. That item included in this header is a declaration of the function printf(), scanf() etc. almost any program needs to perform input/output operations.

What is C language?

C is a popular high-level programming language. It was developed at AT&T's Bell Laboratory of USA in 1972. It was designed and written by a man named Dennis Ritchie. C was invented by Dennis Ritchie of AT&T's Bell Laboratories to provide a high-level language, in which the UNIX operating system could be programmed. It is now widely used for many other applications as well.

What is ANSI C?

The American National Standard Institute (ANSI) developed a standard version of the C language. The standard version is called ANSI C.

What is use of Turbo C++?

The compiler used for C language is Turbo C++. It is the implementation of Borland International for C language. It is used to create, edit and save programs. It also provides a powerful debugger. The debugger helps users in detecting and removing errors in programs.

What are the advantages of C languages?

Some important advantages of C language are as follows:

- Convenient language
- Well structured language
- Machine independence
- Modularity
- Case sensitive
- Hardware control
- Small language
- Fast code generation

What is machine independence?

Machine independence means that programs written in one language can be executed on different types of computers. For example a program written in C can be executed on Intel processors and Motorola processors with a little modification.

What is the basic structure of C program?

The format of writing C program is called its structure. The basic structure of a C program is very flexible. It increases the power of language. It consists of the following:

- Preprocessor Directive (#)
- Main() function
- Body of the program (C Statements)

What is the preprocessor directive?

The preprocessor directives are commands that give instruction to C preprocessor. The preprocessor is used to modify your program according to the preprocessor directives in your source code. Preprocessor directives give the preprocessor specific instructions on how to modify your source code. The preprocessor reads in all of your include files and the source code you are compiling and creates a preprocessed version of your source code. The sign of preprocessor is hash # symbol. All the preprocessors are written at the start of the program.

What are the types of preprocessor directives?

Two types of preprocessor directives are used in C language.

- include
- define

What is the use of include preprocessor?

The include preprocessor directive enables a program to access a library. It allows the preprocessor to insert definitions from a standard header file into C program before compilation. It is used to include header files in the program.

What is a header file?

Header files are collection of standard library functions to perform different tasks. Header file contain declarations to functions and variables and have .h extension. Examples of header files include stdio.h, conio.h, string.h, math.h and strlib.h etc.

What is the main() function?

The main() function is the place where execution of a C program starts. When the program is executed, the control enters main() function and starts executing its statements. Every program must contain main() function.

What is void main()?

main() is a program building block called function. C programs contain one or more functions, exactly one of which must be main(). The keyword void to the left of the main indicated that main can not return any value.

What is clrscr()?

It is a built in function for clear screen.

What is terminator (;)?

A terminator (;) at the end of line its means that the statement end with ; all the statements in C are terminated with ; (semicolon) called terminator.

What is getch() function?

It is also a built-in function this function can get any character from user on run time and mostly this function is used for stop any program on any specific location when user can enter any key then program goes on. The getch function is used to input single character from the user. It is an abbreviation of get character. When this function is executed the character entered by the user is no displayed on the screen.

What is getche() function?

The getche function is used to input single character from the user. It is an abbreviation of get character echo. When this function is executed the character entered by the user is displayed on the screen.

What are delimiters?

The statements of the program are written in curly braces. The curly brace { is called opening brace and } is called closing brace. The braces are also known as delimiters. These statements are collectively called the body of a program.

What is a local block?

A local block is any portion of a C program that is enclosed by the left brace ({) and the right brace (}). A C function contains left and right braces and therefore anything between the two braces is contained in a local block. An if statement or a switch statement can also contain braces so the portion of code between these two braces would be considered as local block.

What is C statement?

A statement in a C language is an instruction for the computer to perform a task. The statements are written in curly brackets. Each statement in C is terminated with terminator (; semicolon).

What is C terminator (;)?

Every statement in C program is end with terminator (; semicolon) sing. The compiler generates an error if any statement is not end with terminator (;) sing.

What are the necessary steps taken to prepare a C program for execution?

- Creating a program
- Editing a program
- Saving a program
- Linking a program
- Loading a program

What are C Character Sets?

- Uppercase A - Z
- Lowercase a - z
- Digits 0 – 9
- Special characters

These are used as building blocks to form basic program elements.

What is Identifier?

The identifiers are the names used to represent variable, constant, types, functions and labels in the program. An identifier in C may consist of any number of characters. But the first 31 character are significant to C compiler.

What are the types of identifier?

There are two types of identifier in C Language:

- Standard Identifiers
- User-defined Identifiers

What is standard identifier?

A type of identifier that has special meaning in C is known as standard identifier. The standard identifiers can be redefined to use in the program for other purpose but it is not recommended. C cannot use a standard identifier for its original purpose if it is redefined.

What is user-defined identifier?

The type of identifier that is defined by the programmer to access memory location is known as user-defined identifiers are used to store data and program result.

What is constant?

In C language unchangeable value is called constant. A Constant is a quantity that cannot be changed during program execution.

What are the types of constant?

C language provides following two types of constants:

- Numeric Constants
- Character Constants

What are numeric constants?

Numeric constants are consists of numbers. It can further divided into two types:

- Integer constants
- Real constants

What are integer constants?

Integer constants are numeric values without fraction or decimal point. Integer constants represent values that are counted. Both positive and negative integer constant are used. The minus sign (-) is used for negative integer constants. If no sign is used the value is positive by default. Some examples of valid integer constant are: 87, 566, 7145, -225, -600 and -9528 etc. The allowable range for integer constant is -32,768 to 32,767.

What are real constants or floating-point constants?

Real constants are numeric values with decimal point. Real constant represent values that are measured. Both positive and negative real constant are used. The minus sign (-) is used for negative real constants. Real constant are often called floating point constant. The real constants could be written in two forms, exponential form and fractional form. Some examples of valid real constants are: 87.5, 566.105, 7145.85, -225.231, -600.58 and -9528.658 etc. Range of real constant expressed in exponential form is -3.4e38 to 3.4e38.

What is character constant?

Any character written within apostrophe or single inverted coma (‘) is known as character constant. All alphabetic characters, digits and special symbols can be used as character constant. A character constant is enclosed by single quotes such as ’a’. The maximum length of character constant is 1 character. Example of some character constant are ‘a’, ‘n’, ‘9’, ‘4‘, ‘+’, ‘*’, ‘~’ and ‘$’ etc. The length of character constant can be 1 character.

What is variable?

In C language changeable value is called variable. A variable is a named memory location or memory cell. It is used to store programs input data and its computational result during execution. The value of variable may change during the execution of the program. The value stored in a variable is referred by variable name. The variables are created in RAM. That’s why the data stored in variable is also temporary. It can only be used and processed during the execution of program.

What are the types of variables?

C provides three types of variables.

- Integer variables
- Floating point variables
- Character variables

What is a variable declaration?

The process of specifying the variable name and its type is called variable declaration. A variable must always be declared before it can be used in a program. The compiler gives an error in an undeclared variable us used in a program.

What is variable initialization?

The process of assigning a value to a variable at the time of declaration is called variable initialization. The equal sign = is used to initialize a variable. Variable name is given on left side and value is given on the right side of the equal sign.

What is data type?

The data type defines as a set of values and a set of operations on those values. The computer manipulates various types of data. The data and its types are defined before designing the actual program used to process the data. The type of each data value is identified at the beginning of program design. It is accomplished by associating certain data types to the variables.

What are the types of data types?

C language provides two ways to use data types:

- Standard data type
- User-define data type

What is standard data type?

C language defines some standard data types. A data type that is predefined in the language is called standard data type. Some examples of standard data type are int, float, long and char etc.

What is the user-define data type?

C also allows the user to define its own data types known as user-define data types.

What is int data type use in C language?

The int data type is used to represent integer values. An integer variable stores a number with no fractional part such as 600, 350 and 60 etc. It takes two or four bytes in memory depending on the computer and compiler being used. Usually it takes two bytes and its range is from -32768 to 32767.

What is short int data type use in C language?

The short data type is used to store integer values. It takes two bytes in memory. Its range is from -2^{15} to $2^{15}-1$. It means the valid numbers are from -32768 to 32767. The short int is also called short.

What is unsigned int data type use in C language?

The unsigned int data type is used to store only positive integer values. It takes two bytes in memory. Its range is from 0 to $2^{16}-1$. It means that valid numbers are 0 to 65635. The unsigned int is also called unsigned.

What is long int data type use in C language?

The long data type is used to store large integer values. It takes four bytes in memory. Its range is from -2,147,483,648 to 2,147,483,647. The long int is also called long.

What is unsigned long int data type use in C language?

The unsigned long data type is store large positive integer values. It takes four bytes in memory. Its range is from 0 to 4,294,967,295. The unsigned long int is also called unsigned long.

What is float data type use in C language?

The float data type is used to store real values. It takes four bytes in computer memory. Its range is from $3.4\text{x}10^{-38}$ to $3.4\text{x}10^{38}$. It provides the precision of six decimal places.

What is double data type use in C language?

The double data type is used to store large values. It takes eight bytes in memory. Its range is from $1.7\text{x}10^{-308}$ to $1.7\text{x}10^{308}$. It provides the precision of fifteen decimal places.

What is long double data type use in C language?

The long double data type is used to store very large real values. It takes ten bytes in memory. Its range is from $1.7\text{x}10^{-4932}$ to $1.7\text{x}10^{4932}$. It provides the precision of nineteen decimal places.

What is char data type use in C language?

The char data type is used to store character value. It takes 1 byte in memory. It is used to represent a letter, number or punctuation mark and a few other symbols. Character values are normally given in single quotes. It can represent individual character such as 's', 'h', 'z', '7', '5', and '#'. The singed character can represent numbers from -128 to 127. The unsigned characters can represent number from 0 to 255.

What are the keywords?

The keywords are the words meaning has already been explained to the compiler. The keywords cannot be used as a variable name if we do so we are trying to assign a new meaning to the keyword, which are not allowed by the computer. All keyword are present in lower case. Keywords are also known as reserved words.

How many keywords are present in C language?

In C language we are available only 32 keywords. There are 32 keywords that, when combined with the formal C syntax, form the C language as defined by the ANSI C.

What are the input and output statements?

Standard output function is printf() and the standard input function is scanf(). Output is sent to the standard output device monitor and the input is supplied using the standard input device keyboard.

What is the format specifier?

The format specifier are used for specify compiler that what type of variable we can use for input and output. For example %d use for integer values and %f is use for float or real values.

What is the escape sequence?

The escape sequences are the special type of character(s) used in format string to modify the format of output and started with \ indicating that the next character should be interpreted as special character with special meaning rather then treating as a normal character. These characters are not displayed in the output. These characters are always begins with backslash (\). The backslash is known as escape character. For example \n is use for new line etc.

What are comments in C language?

The comments are the lines of program that are not executed. The compiler ignores comments and does not include them in the executable program. That is why the comments do not affect the size of executable program. Comments are notes about different lines of code that explain the purpose of the code. The user can insert information notes in the code. Comments can be added anywhere in the code.

What are the types of comments in C language?

Comments are added in programs in two ways:

- Single line Comments
- Multi line Comments

What are the single line comments?

Comments on single line are added by using double slash "//". Any thing written on the right side of the double slash is considered as comments. For example: //this is a comment etc.

What are the multi-line comments?

Multi-line comments are inserted to the code by placing /* at the beginning of the comments and */ character is used to end the multi-line comments. For example: /* these lines are for the purpose of writing comments */.

What is expression?

A statement that evaluates to a value is called an expression. An expression gives a single value. An expression consists of operators and operands. An operator is a symbol that performs some operation. Operand is the value on which the operator performs some operation. Operands can be a constant, variable or function. It also consists of constants and variables combined together with operators.

What are operators?

Operators are use on operand. Operators are the symbols that are used to perform certain operations on data.

What are the types of operators?

C provides a variety of operators. Commonly used operators are:

- Arithmetical Operators
- Assignment Operators
- Compound Assignment Operator
- Relational Operators
- Logical Operators
- Increment Operator
- Decrement Operator

What are the arithmetical operators?

Arithmetical operators are symbols that perform mathematical operations on data. C language provides five arithmetical operations. Following is a list of arithmetical operators that used in C:

- + (Addition)
- - (subtraction)
- * (Multiplication)
- / (Division)
- % (Reminder)

What is the modulus operator?

The modulus operator is % (percentage sign) the remainder left over after a division the value of the variable. 20%3 the following condition uses the modulus operators to calculate the modulus of 20%3. To work this out divide 20 by 3, now 3 divides into 20 six times, with a remainder left over of 2. So the value of 2 is assigned to count.

What is the assignment operator?

The basic assignment operator is = (equal sign). This is used to assign value of an expression to variable. It has the general form **variable = expression** Where expression may be a constant another variable to which a value has previously been assigned or a formula to be evaluated. The name of variable is written on the left side of the assignment operator and the value is written on the right side of the assignment operator. The value can be a constant, variable and expression or function. For example sum=a+b;

What are the compound assignment operators?

C language provides compound assignment operators that combine assignment operator with arithmetical operators. Compound assignment operators are used to perform mathematical operations more easily. The general syntax of compound assignment operator is

variable op = expression;
S+=5 **(or)** S=S+5

What are the relational operators?

Relational operators are used to compare two values of the same type and the relational operators are also used to specify conditions in programs. They compare two values and produce result as true or false. They produce a non-zero value if the result is true. The value is produced in most of the cases. They produce 0 if the result is false.

What are the types of relational operators?

In C there are six types of relational operators

- > (greater than)
- < (smaller than)
- >= (greater than is equal to)
- <= (smaller than is equal to)
- == (equal to)
- != (not equal to)

What are logical operators?

The logical operators are used for forming compound conditions from simple ones. Logical operators are the special type of operator use to condense and clarify the complicated selection structures as well as other constructions.

What are types of logical operators?

In C there are three types of logical operators

- && (AND)
- || (OR)
- ! (NOT)

What is the increment operator?

The increment operator is ++ and this operator adds one to the value of the variable. The increment operator is used to increase the value of a variable by 1. It is denoted by the symbol ++.

What is the decrement operator?

The decrement operator is -- and this operator subtracts one to the value of the variable. The decrement operator cannot decrement the value of constants and expressions. It is denoted by the symbol --.

What is loop?

When we want to repeat some portion of the program either specified number of times or until a particular condition is being satisfied. This repetitive operation is done through a loop control structures. A statement or a set of statements that is executed repeatedly is called loop.

What are the types of loops?

There are three methods which can repeat a part of program. So there are three types of loops in C.

- For Loop
- While Loop
- Do While Loop

What is for loop?

The for loop executes one or more statements for a specified number of times. This loop is also called counter-controlled loop. It is the most flexible loop. That is why the most programmers use this loop in programs. The for loop allows us to specify three things about a loop in a singles line are initialization, condition and increment/decrement.

What is while loop?

The while loop is the simplest loop of C language. This loop executes one or more statements while the given condition remains true. It is useful where the number of iterations is not known in advance. While loop first checks the condition in case of condition is true it executes its body and if condition is false it can't execute its body.

What is do-while loop?

The do-while is an iterative control in C language. This loop executes one or more statements while the given condition is true. In this loop, the condition comes after the body of loop. The loop is important in a situation where a statement must be executed at least once. Do while loop executes its body at first time and then check condition if condition is true then execute second time other wise if condition is false then it execute body only one time.

What is the difference between while and do-while loop?

In while loop condition comes before the body of the loop. In do-while loop condition comes after the body of the loop. If condition is false in the beginning, while loop is never executed but do-while loop is executed at least once even if condition is false.

What is nested loop?

A loop within a loop is called nested loop. In nested loops, the inner loop is executed completely with, each change in the value of counter variable of outer loop. The nesting can be done up to any level. For example, the while loop can be used as outer loop and for loop can be used as inner loop in nested loop.

What is counter-controlled loop?

The counter controlled loop depends on the value of a variable called counter variable. The value of counter variable is incremented or decremented each time the body of loop executes. The loop terminates when value of counter variable reaches a particular value.

What is sequential-controlled loop?

The sequential-controlled loop depends on special value called sentinel value. Sentinel value indicates that the loop should continue or terminate. For example a loop may execute while the value of variable is not -1. Here -1 is the sentinel value that is used to terminate loop.

What is sentinel value?

Sentinel value indicates that the loop should continue or terminate. It works as an end marker that follows the last item in a list of items.

What is the break statement?

The break statement is used in the body of the loop to exit from the loop. When this statement is executed in the loop body, the remaining iterations of the loop are skipped. The control directly moves outside the body and the statement that comes after the body is executed.

What is the continue statement?

The continue statement is used in the body of the loop. It is used to move the control to the start of the loop body. When this statement is executed in the loop body, the remaining statements of current iteration are not executed. The control directly moves to the next iteration.

What is goto statement?

The goto statement is used to perform an unconditional transfer of control to a named label. The label must be in the same function. A label is meaningful only to a goto statement.

What is control structure?

A statement used to control the flow of execution in a program or function is called control structure. The control structures in C are used to combine individual instruction into a single logical unit. The logical unit has one entry point and one exit point. The instructions in a program can be organized in three kinds of control structures to control execution flow. All simple or complex programs can use these control structure to implement the program logic.

What are the types of control structure?

In C there are three types of control structures

- Sequence Structure
- Selection Structure
- Repetition Structure

What is the sequence structure?

In sequence structure the instructions are executed in the same order in which they are specified in the program. The control flows from one statement to other in a logical sequence.

What is the selection structure?

A selection structure selects a statement or set of statements to execute on the basis of a condition. A statement or set of statements that is executed when a particular condition is true and ignored when the condition is false is called condition statement. Selection of one or multiple statements out of several statements depending upon some criteria is called selection structure.

What are the types of selection structure?

In C language there are different types of selection structure

- if statement
- if else statement
- else if statement
- switch statement
- conditional operator

What is the repetition structure?

A repetition structure executes a statement or set of statement repeatedly. It is also known as iteration structure or loop.

What are the types of repetition structure?

The repetition structures include

- for loop
- while loop
- do-while loop

What is the if statement?

The if statement is the single selection statement used for selecting the single or multiple statements if the defined condition is hold, otherwise the statement(s) is skipped and the control is transfer to the next statement(s) of the program.

What is the if else statement?

The if else is the double selection statement used for executing the statement(s) if the particular condition is satisfied, otherwise another block of statement(s) will be executed. It executes one block of statement(s) when the condition is true and the other when it is false. In any situation, one block is executed and the other is skipped.

What is the else if statement?

The else if statement is used when the program has several blocks of statements and we want to execute one block depending upon some condition. If the first condition is true then the statements following the first block will be executed, otherwise the second block will be checked and if it is satisfied then the statements following it will be executed otherwise the next condition will be checked in the same way and so on.

What is the switch statement?

The control statement which allows us to make a decision from the numbers of choices is called a switch or more correctly a switch-Case-Default, since these three keywords go together. Switch is a multiple selection structure and it is similar to the else-if construct but has more flexibility and a clear format.

What is the conditional or ternary operator?

Conditional operator is a decision making structure. It can be used in place of simple if else structure. It is also called ternary operator as it uses three operands. It is the short form of if-else construct. The conditional operator is also some times called the ternary operator since they take three arguments.

(condition expression) ? true case statement : false case statement ;

When is a switch statement better than multiple if statements?

A switch statement is generally best to use when you have more than two conditional expressions based on a single variable of numeric type.

What is the array?

An array is a collection of consecutive memory locations. Each memory location is called an element of array. Each elements of an array is of same data type. The number of elements in an array is called the length of array.

What is string?

A collection of characters written in double quotations is called as string. Character variables are used to store a string. The length of string is given in brackets in declaration statement. A sequence of characters is generally called a string.

What are the gets() and puts() functions?

To solve the problem of storing multiword strings, C uses library function gets() which stands for get string and its purpose is to get a string from the keyboard and store it in a string array specified in this function. There is a similar function puts() used with strings and its purpose is to output strings.

What is function?

A function is a piece of code. The function is designed to perform a specific task. It is a complete and independent program. It is executed by the main function or any other function of the program. A function is a named block of code that performs some action. The functions are used to accomplish the similar kinds of tasks again and again without writing the same code again. They are used to perform the tasks that are repeated many times.

What is the importance of functions?

A program may need to repeat the same piece of code at various places. It may be required to perform certain tasks repeatedly. The program may become very large if functions are not used. The piece of code that is executed repeatedly is stored in a separate function. The real reason of using functions is to divide a program into different parts. These parts of a program can be managed easily.

What are the types of functions?

There are two types of function in C.

- Built-in Function (Library Function)
- Non Built-in Function (User-define Function)

What are the built-in functions or Library functions?

The built-in functions that have already been define as a part of the language and can be used in any program are called built-in functions. These are also called library functions. A type of function that is available as a part of language is called built-in function or library function. These functions are ready-made programs and stored in different header files. Built-in functions make programming faster and easier. For example printf, scanf, getch etc.

What are the non built-in functions or user define functions?

The non built-in functions created by user are called user-define functions. These are also called programmer define functions. These are written to perform one specific task in the program. These functions are written for specific use. A type of function written by the programmer is called user-defined function. User-defined function has a unique name. A program may contain many user-defined functions. These functions are written according to the exact need of the user.

What are the advantages of the function?

Some important advantages or benefits of using functions are

- Easier to code
- Easier to modify
- Easier to maintain
- Easier to debug
- Reuseability
- Less programming time

What is the function declaration or function prototype?

Specifies the name, type, arguments of a function is called function declaration. It is also called function prototype.

What is the function header?

The first line of a function definition is called function header. The function header is consists of return type, function name and parameters.

What is the function name?

The function name indicates the name of the function.

What are the parameters?

Parameters are the values that are provided to a function when the function is called.

What is the function body?

The set of statements which are executed inside the function is called function body. The body of function appears after function header. The statements are written in curly braces { }. The variable declaration and program logic are implemented in function body. The arguments passed to a function can also be used in the function body.

What is the function definition?

A set of statements that explains what a function does is called function definition. The function definition can be written at the following places

- Before main() function
- After main() function
- In a separate file

What is the function call?

The statement that activates a function is called function call. A function is called with its name. Function name is followed by necessary parameters in parentheses. If there are many parameters these are separated by commas. If there is no parameter, empty parentheses are used.

How a function returns value?

A function can return a single value. The return type in function declaration indicates the type of value returned by a function. The keyword return us used to return the value back to the calling function.

What is the local variable?

A variable declared inside a function is called local variable. Local variables are also called automatic variables.

What is the global variable?

A variable declared outside any function is called global variable. Global variables can be used by all functions in the program. The values of these variables are shared among different functions. If one function changes the value of a global variable, this change is also available to other functions.

Why should I prototype a function?

A function prototype tells the compiler what kind of arguments a function is looking to receive and what kind of return value a function is going to give back. This approach helps the compiler ensure that calls to a function are made correctly and that no erroneous type conversions are taking place.

How many parameters should a function have?

There is no set number or guideline limit to the number of parameters your functions can have.

What is stream?

A logical interface to a file is called stream. A stream is associated with a file using an open operation. The stream is disassociated from a file using a close operation.

What are the types of streams?

There are two types of streams in C language

- Text Stream
- Binary Stream

What is text stream?

A text stream is a sequence of characters. A certain character translation may occur in a text stream. For example, a new line may be converted to a carriage return/line feed pair. It means that there may not be a one-to-one relationship between the written characters and the characters in external device.

What is binary stream?

A binary stream is a sequence of bytes. The translation is not performed in binary stream. It exists with a one-to-one correspondence to the external devices. It means that the number of bytes written or read is the same as the number of bytes on the external device.

What is EOF marker?

A text file a named collection of characters saved in secondary storage such as disk. The text file has no fixed size. A special end-of-file character is used to indicate the end of a text file. It is placed after the last character in the file. It is denoted by EOF in C language.

What is Newline marker?

The ENTER key is used to move the cursor to the next line in a text editor such as Notepad. A newline character is placed at the end of each line when the user Enter key. The newline is denoted by \n in C language.

What is file in C language?

In C a file may be anything from a disk file to a terminal or printer. You associate a stream with a specific file by performing an open operation. Once a file is open information can be exchanged between it and your program.

What is pointer?

A type of variable that is used to store the memory address of a memory cell is known as pointer. It normally stores the memory address of a variable or object. The data type of a pointer must be same as data type of the variable whose memory address is stored in pointer.

What is a file pointer?

File pointer is a pointer that refers to a file on the secondary storage. It is a variable of type FILE that is defined in stdio.h. It is used to access and manipulate a data file. A program has to declare a file pointer to use a file. The file pointer is associated with a file after declaration. One file pointer can be associated with only one data file.

What is fopen function in filling?

We have to open a file to be able to do anything else with it. For this we use fopen. This function takes two arguments the first one is the path to your file including the filename. The second argument is another char* and determines how the file is opened by your program.

What is fclose function in filling?

When you've finished with a file it's best if you closed it seems logical enough! Simply pass it a FILE pointer but be warned don't pass a NULL pointer it points to nothing or your program might crash.

Practical: 1

Write a program to print "Assalam-O-Alaikum" on the screen.

Program

```
#include<stdio.h>
#include<conio.h>
void main(void)
{
printf("Assalam-O-Alaikum");
getch();
}
```

Output

```
Assalam-O-Alaikum
```

After writing the above program in C IDE, compile it with the help of pressing **Alt+F9** from the keyboard or by selecting the **Compile** option from the compile menu if there is any error debug the program otherwise run the program by pressing **Ctrl+F9** or select **Run** option from the run menu. Now you are able to see your program output.

Practical: 2

Write a program to print your name with in a chunk of stars.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
printf("\n************************");
printf("\n**   My Name is Zaffar    **");
printf("\n************************");
getch();
}
```

Output

```
************************
**   My Name is Zaffar    **
************************
```

Practical: 3

Write a program to print your name and address into two lines. Using of new line escape sequence.

Program

```
#include<stdio.h>
#include<conio.h>
void main(void)
{
clrscr();
printf("My name is Syed Zaffar Iqbal. \nI live in Quetta city.");
getch();
}
```

Output

```
My name is Syed Zaffar Iqbal.
I live in Quetta city.
```

Practical: 4

Write a program to read three integers values and print their sum.

Program

```
#include<stdio.h>
#include<conio.h>
void main(void)
{
int v1, v2, v3, sum;
v1=10;
v2=20;
v3=30;
printf("\nFirst value is %d",v1);
printf("\nSecond value is %d",v2);
printf("\nThird value is %d",v3);
sum=v1+v2+v3;
printf("\nThe sum is %d",sum);
getch();
}
```

Output

```
First value is 10
Second value is 20
Third value is 30
The sum is 60
```

Practical: 5

Write a program which prints a text of 4 lines consisting of characters, integer values and floating point values using print statement.

Program

```
#include<stdio.h>
#include<conio.h>
void main(void)
{
int y=2009, m=10;
float r1=3.70, r2=4.90;
clrscr();
printf("\n\nBalochistan is the largest province of Pakistan.\n");
printf("According to %d estimates Balochistan has \na population of roughly %d million.\n",y,m);
printf("Balochistan share of the National Economy has\n");
printf("historically ranged between %.2f percent to %.2f percent.",r1,r2);
getch();
}
```

Output

```
Balochistan is the largest province of Pakistan.
According to 2009 estimates Balochistan has
a population of roughly 10 million.
Balochistan share of the National Economy has
historically ranged between 3.70 percent to 4.90 percent.
```

Practical: 6

Write a program that calculates the area of a rectangle.
Area = Width x Length

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
clrscr();
int a,w,l;
printf("Enter value of rectangle width= ");
scanf("%d",&w);
printf("Enter value of rectangle length= ");
scanf("%d",&l);
a=w*l;
printf("The area of rectangle is %d.",a);
getch();
}
```

Output

```
Enter value of rectangle width= 12
Enter value of rectangle length= 15
The area of rectangle is 180.
```

Practical: 7

Write a program to calculate the area of a circle.

A = pi x r^2

Program

```
#include<stdio.h>
#include<conio.h>
void main(void)
{
float pi=3.14;
float r,a;
clrscr();
printf("\nEnter Radius of a Circle= ");
scanf("%f",&r);
a=pi*r*r;
printf("\nThe Area of a Rectangle is= %.3f",a);
getch();
}
```

Output

```
Enter Radius of a Circle= 12
The Area of a Rectangle is= 452.160
```

Practical: 8

Write a program uses the single character format specifier %c.

Program

```
#include<stdio.h>
#include<conio.h>
void main(void)
{
char c1, c2;
clrscr();
c1=‘S’;
c2=‘H’;
printf(“The simple characters %c and %c.”,c1,c2);
getch();
}
```

Output

```
The simple characters S and H.
```

Practical: 9

Write a program that performs all arithmetical operations on two variables.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int s,h;
clrscr();
printf("\nEnter First Value= ");
scanf("%d",&s);
printf("\nEnter Second Value= ");
scanf("%d",&h);
printf("\nAddition = %d",s+h);
printf("\nSubtraction = %d",s-h);
printf("\nMultiplication = %d",s*h);
printf("\nDivision = %d",s/h);
printf("\nReminder = %d",s%h);
getch();
}
```

Output

```
Enter First Value= 5
Enter Second Value= 2
Addition = 7
Subtraction = 3
Multiplication = 10
Division = 2
Reminder = 1
```

Practical: 10

Write a program that reads and prints using Escape Sequence (asking the name, age, height and gender) of the students using printf and scanf statements.

Program

```
#include<stdio.h>
#include<conio.h>
void main(void)
{
char nam[20], g[6];
int age;
float h;
clrscr();
printf("Enter Your Name: ");
scanf("%s",&nam);
printf("Enter Your Age: ");
scanf("%d",&age);
printf("Enter Your Height: ");
scanf("%f",&h);
printf("Enter Your Gender [Male/Female]: ");
scanf("%s",&g);
printf("\nYour name is %s.\nYou are %d years old.\n",nam,age);
printf("Your height is %.1f.\n",h);
printf("You are a %s student.\n",g);
getch();
}
```

Output

```
Enter Your Name: Maria
Enter Your Age: 19
Enter Your Height: 4.7
Enter Your Gender [Male/Female]: Female
Your name is Maria.
You are 19 years old.
Your height is 4.7.
You are a Female student
```

Practical: 11

Write a program in for loop that can print 10 to 1.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int m;
clrscr();
for(m=10;m>=1;m--)
printf("\n%d",m);
getch();
}
```

Output

```
10
9
8
7
6
5
4
3
2
1
```

Practical: 12

Write a program which uses for loop statement to generate the multiplication table from 2 to 20.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a,b,ab;
clrscr();
for(a=2;a<=20;a++)
{
for(b=1;b<=10;b++)
{
ab=a*b;
printf("\n%d x %d = %d",a,b,ab);
}
}
getch();
}
```

Output

```
2 x 1 = 2
2 x 2 = 4
...
...
2 x 10 = 20
3 x 1 = 3
3 x 2 = 6
...
...
20 x 10 = 200
```

Practical: 13

Write a program that displays the given star output using nested for loop.

```
*
* *
* * *
* * * *
* * * * *
```

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int i,j;
clrscr();
for(i=1;i<=5;i++)
{
for(j=1;j<=i;j++)
printf("*");
printf("\n");
}
getch();
}
```

Output

```
*
* *
* * *
* * * *
* * * * *
```

Practical: 14

Write a program that displays your name for five time using while loop.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int zs;
zs=1;
clrscr();
while(zs<=9)
{
printf("\nSalman Danish");
zs++;
}
getch();
}
```

Output

```
Salman Danish
Salman Danish
Salman Danish
Salman Danish
Salman Danish
Salman Danish
Salman Danish
Salman Danish
Salman Danish
```

Practical: 15

Write a program to print the corresponding Celsius to Fahrenheit table using while loop.

Program

```
#include<stdio.h>
#include<conio.h>
int main(void)
{
  float fahr,celsius;
  int lower,upper,step;
  lower=0;
  upper=70;
  step=10;
  clrscr();
  printf("\nC     F\n\n");
  celsius = lower;
  while(celsius <= upper)
  {
  fahr = (9.0/5.0) * celsius + 32.0;
  printf("%3.0f %6.1f\n", celsius, fahr);
  celsius = celsius + step;
  }
getch();
}
```

Output

```
 C       F
 0      32.0
10      50.0
20      68.0
30      86.0
40     104.0
50     122.0
60     140.0
70     158.0
```

Practical: 16

Write a program which uses while loop and nested while loop (use for loop and continue the process in while loop) satisfying this condition.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int a,loop,count;
for(a=1; a<=2; a++)
{
loop=1;
while(loop<=7)
{
count=1;
while(count<=loop)
{
printf("%d",count);
count++;
}
printf("\n");
loop++;
}
getch(); }
}
```

Output

```
1
12
123
1234
12345
123456
1234567
1
12
123
1234
12345
123456
1234567
```

Practical: 17

Finding the factorial of N using 'while' loop read value of N using scanf and print factorial of various N.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int n,r=1,c=2;
clrscr();
printf("\nEnter the value of N:");
scanf("%d",&n);
while(c<=n)
{
r=c*r;
c=c+1;
}
printf("Factorial of N is %d",r);
getch();
}
```

Output

```
Enter the value of N: 7
Factorial of N is 5040
```

Practical: 18

Write a program that print A to Z alphabet using do-while loop.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
char ch;
clrscr();
ch='A';
do
{
printf (" %c",ch);
ch++;
}
while(ch<='Z');
getch();
}
```

Output

```
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
```

Practical: 19

Write a program that will change temperature Fahrenheit to Celsius in nested do while loop.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int temp;
float celsius;
char repeat;
char flag;
clrscr();
do
{
flag='n';
do
{
if(flag=='n')
printf("\nInput a valid temperature: ");
else
printf("\nInput a valid temperature, again:");
scanf("%d",&temp);
flag='y';
}
while (temp<0||temp >100);
celsius=(5.0/9.0)*(temp-32);
printf("%d degrees F is %6.2f degrees Celsius\n",temp,celsius);
printf("Do you have another temperature?");
repeat=getch();
putchar('\n');
}
while (repeat=='y' || repeat=='Y');
getch();
}
```

Output

```
Input a valid temperature: 42
42 degrees F is 5.56 degrees Celsius
Do you have another temperature? n
```

Practical: 20

Write a program to calculation of bonus.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int bonus,cy,yoj,yos;
clrscr();
printf("Enter current year: ");
scanf("%d",&cy);
printf("Enter year of joining: ");
scanf("%d",&yoj);
yos=cy-yoj;
if(yos>3)
{
bonus=2500;
printf("Bonus is Rs.%d",bonus);
}
getch();
}
```

Output

```
Enter current year: 2009
Enter year of joining: 2004
Bonus is Rs.2500
```

Practical: 21

Write a program that reads three subjects numbers and calculate its sum, average and grade.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int e,u,c,om,avg;
clrscr();
printf("\nEnter marks of English: ");
scanf("%d",&e);
printf("Enter marks of Urdu: ");
scanf("%d",&u);
printf("Enter marks of Computer: ") ;
scanf("%d",&c);
om=e+u+c;
printf("Sum = %d",om);
avg=om/3;
printf("\nAverage = %d",avg);
if(avg>=70)
printf("\nGRADE A");
if(avg>=50&&avg<70)
printf("\nGRADE B");
if(avg>=33&&avg<50)
printf("\nGRADE C");
if(avg<33)
printf("\nFAIL");
getch();
}
```

Output

```
Enter marks of English: 66
Enter marks of Urdu: 75
Enter marks of Computer: 92
Sum = 233
Average = 77
GRADE A
```

Practical: 22

Write a program that reads three numbers and prints its largest.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int n1,n2,n3,larg;
clrscr();
printf("Enter three numbers: ");
scanf("%d%d%d",&n1,&n2,&n3);
larg=n1;
if(n2>larg)
larg=n2;
if(n3>larg)
larg=n3;
printf("Largest Value is %d.",larg);
getch();
}
```

Output

```
Enter three numbers: 60
49
99
Largest Value is 99
```

Practical: 23

Write a program which uses operators. Calculate the area of triangles, volume of sphere and arrange the resultant values in ascending order

Program

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main(void)
{
float a,b,c,s,area,dos,vol;
clrscr();
printf("\n\nEnter Triangle Side A: ");      scanf("%f",&a);
printf("Enter Triangle Side B: ");          scanf("%f",&b);
printf("Enter Triangle Side C: ");          scanf("%f",&c);
printf("Enter diameter of sphere: ");       scanf("%f",&dos);
s=(a+b+c)/2;
area=sqrt(s*(s-a)*(s-b)*(s-c));
vol=(3.14/6)*(dos*dos*dos);
if(vol>area)
{
printf("\nArea of Triangle= %.2f",area);
printf("\nVolume of Sphere= %.2f",vol);
}
else
{
printf("\nVolume of Sphere=%.2f",vol);
printf("\nArea of Triangle= %.2f",area);
}
getch();
}
```

Output

```
Enter Triangle Side A: 9
Enter Triangle Side B: 9
Enter Triangle Side C: 13
Enter diameter of sphere: 13
Area of Triangle= 40.46
Volume of Sphere= 1149.76
```

Practical: 24

Write a program that reads a phrase and prints the number of upper case and lower case letters in it.

Program

```
#include<stdio.h>
#include<conio.h>
#include<ctype.h>
#include<string.h>
void main()
{
char text[30];
int small=0,capital=0,a;
clrscr();
printf("\nEnter some text here: ");
gets(text);
for(a=0;a<strlen(text);a++)
if(isupper(text[a]))
capital++;
else if(islower(text[a]))
small++;
printf("Small : %d, Capital : %d",small,capital);
getch();
}
```

Output

```
Enter some text here: My name is Zaffar Iqbal
Small : 16, Capital : 3
```

Practical: 25

Draw a character and print it using if-else statement and extend the program using nested if-else.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int b,s,i,j;
clrscr();
b=0;
s=0;
printf("\nHow many biffs do you want to square: ");
scanf("%d",&b);
printf("\n");
for(i=0; i<b; i++)
{
for(j=0; j<b; j++)
 {
 if(s==0)
 {
 printf("_");
 s=1;
 }
else
 {
 if(s==1)
 {
 printf("#");
 s=0;
 }
 }
}
printf("\n");
}
getch();
}
```

Output

```
How many biffs do you want to square: 8
_#_#_#_#
_#_#_#_#
_#_#_#_#
_#_#_#_#
_#_#_#_#
_#_#_#_#
_#_#_#_#
_#_#_#_#
```

Practical: 26

Write a program that demonstrates using of switch.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
int num;
clrscr();
printf("Enter a number [1, 2 or 3]: ");
scanf("%d",&num);
switch(num)
{
case 1:
printf("One is pressed!");
break;
case 2:
printf("Two is pressed!");
break;
case 3:
printf("Three is pressed!");
break;
default:
printf("Any Other value is pressed!");
}
getch();
}
```

Output

```
Enter a number [1, 2 or 3]: 3
Three is pressed!
```

Practical: 27

Write a program which uses a 'switch' statement and breaks the program if certain condition is observed. Repeat the program with 'case' statement.

Program

```
#include<stdio.h>
#include<conio.h>

void main()
{
int m;
clrscr();

do
{
printf("\n\nEnter the number of the month [1 to 12]: ");
scanf("%d",&m);
printf("\n\nName of %d month is ",m);

switch(m)
{
case 1:
        printf("January");
        break;
case 2:
        printf("February");
        break;
case 3:
        printf("March");
        break;
case 4:
        printf("April");
        break;
case 5:
        printf("May");
        break;
case 6:
        printf("June");
        break;
case 7:
        printf("July");
        break;
case 8:
        printf("August");
        break;
case 9:
        printf("September");
        break;
case 10:
        printf("October");
        break;
case 11:
        printf("November");
        break;
case 12:
        printf("December");
        break;
default:
        printf("Unknown");
        continue;
}
}
while(m<1 || m>12);
printf(".");
getch();
}
```

Output

```
Enter the number of the month [1 to 12]: 7
Name of 7 month is July.
```

Practical: 28

Write a program to calculate sum and average marks of 30 students.

Program

```
#include <stdio.h>
#include <conio.h>
void main(void)
{
int avg,sum=0 ;
int i;
int marks[30];
clrscr();
for (i=0;i<=29;i++)
{
printf("Enter marks: ");
scanf("%d",&marks[i]);
}
for(i=0;i<=29;i++)
sum=sum+marks[i];
avg=sum/30;
printf("\nSum of marks=%d",sum);
printf("\nAverage marks=%d",avg);
getch();
}
```

Output

```
Enter marks: 40
Enter marks: 40
.
.
.
Enter marks: 40
Sum of marks=1200
Average marks=40
```

Practical: 29

Write a program to demonstrate printing of a string.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
char name[]="Zaffarshah";
int i=0;
while(i<=7)
{
printf("%c",name[i]);
i++;
}
getch();
}
```

Output

```
Zaffarsh
```

Practical: 30

Write a program to demonstrating a simple function.

Program

```
#include<stdio.h>
#include<conio.h>
void table(int n);
void main()
{
int num;
clrscr();
printf("Enter a number: ");
scanf("%d",&num);
table(num);
getch();
}
void table(int n)
{
int s;
for(s=1;s<=5;s++)
printf("%d x %d = %d\n",n,s,n*s);
}
```

Output

```
Enter a number: 3
3 x 1 = 3
3 x 2 = 6
3 x 3 = 9
3 x 4 = 12
3 x 5 = 15
```

Practical: 31

Write a function which generates factorial of N and calls this function in the 'main' program.

Program

```
#include<stdio.h>
#include<conio.h>
int fac(int a);
int main(void)
{
int n,f;
clrscr();
printf("\nEnter the value of N: ");
scanf("%d",&n);
f=fac(n);
printf("\nThe factorial of N is %d.",f);
getch();
}
int fac(int a)
{
int s;
int fact=1;
        for(s=2; s<=a; s++)
        fact=fact * s;
return fact;
}
```

Output

```
Enter the value of N: 7
The factorial of N is 5040.
```

Practical: 32

Write a program to demonstrating local and global variable in a function.

Program

```
#include<stdio.h>
#include<conio.h>
int s;
void func();
void main()
{
clrscr();
printf("Enter a Number: ");
scanf("%d",&s);
printf("\nValue of S before function call: %d",s);
func();
printf("\n\nValue of S after fucntion call: %d",s);
getch();
}
void func()
{
s=s*2;
}
```

Output

```
Enter a Number: 5
Value of S before function call: 5
Value of S after fucntion call: 10
```

Practical: 33

Write a program that inputs two numbers and one arithmetic operator in main function and passes then to a function. The function applies arithmetic operation on two numbers on the basis of the operator entered by user using

Program

```
#include<stdio.h>
#include<conio.h>

void cal(int a,int b,char op);

void main()
{
int x,y;
char c;
clrscr();
printf("\nEnter operator [+,-,*,/,%]:");
scanf("%c",&c);
printf("\nEnter First Number:");
scanf("%d",&x);
printf("\nEnter Second Number:");
scanf("%d",&y);
cal(x,y,c);
getch();
}

void cal(int a, int b, char op)
{

switch(op)
{
case '+':
printf("\n%d + %d = %d",a,b,a+b);
break;

case '-':
printf("\n%d - %d = %d",a,b,a-b);
break;
case '*':
printf("\n%d * %d = %d",a,b,a*b);
break;

case '/':
printf("\n%d / %d = %d",a,b,a/b);
break;

case '%':
printf ("\n%d % %d = %d",a,b,a%b);
break;

default:
printf("\nYou enter invalid operator!");
}
}
```

Output

```
Enter operator [+,-,*,/,%]:+
Enter First Number:50
Enter Second Number:20
50 + 20 = 70

Enter operator [+,-,*,/,%]:*
Enter First Number:5
Enter Second Number:2
5 + 2 = 10
```

Practical: 34

Write a program that inputs two numbers in main function, passes these numbers to a function. The function displays the maximum number.

Program

```
#include<stdio.h>
#include<conio.h>
void max(int a, int b);
void main()
{
int x,y;
clrscr();
printf("Enter 1st number:");
scanf("%d",&x);
printf("Enter 2nd number:");
scanf("%d",&y);
max(x,y);
getch();
}

void max(int a, int b)
{
if(a>b)
printf("Maximum number is %d.",a);
else
printf("Maximum number is %d.",b);
}
```

Output

```
Enter 1st number:13
Enter 2nd number:23
Maximum number is 23
```

Practical: 35

Write a program which uses multiple arguments in a function (develop a user-defined function to generate a rectangle. Use the function for passing arguments to draw different sizes of rectangles and squares.

Program

```
#include<stdio.h>

#include<conio.h>

void box(int l,int w);

void main()
{

clrscr();
   box(2,5);
   box(5,10);
   box(7,5);
   box(3,12);
getch();
}

void box(int l, int w)
{

int a,b,s;

for(a=1; a<=w; a++)
printf("*");

      for(b=1; b<=l; b++)
      {
      s=0;
      printf("\n*");

      while(s<=(w-3))
      {
      s=s+1;
      printf(" ");
      }
      printf("*");
      }
      printf("\n");
      for(a=1; a<=w; a++)
      printf("*");
      printf("\n");
}
```

Output

```
*****
*   *
*   *
*****
**********
*        *
*        *
*        *
*        *
*        *
**********
*****
*   *
*   *
*   *
*   *
*   *
*   *
*   *
*****
************
*          *
*          *
*          *
************
```

Practical: 36

Write a program that will take some lines of text from user and save it, in MS Word file.

Program

```
#include<stdio.h>
#include<conio.h>
void main()
{
FILE *zs;
char ch;
zs=fopen("zaffar.doc","w");
while((ch=getche())!='\r')
putc(ch,zs);
fclose(zs);
getch();
}
```

Output

After successful compilation, run your program. Now a Microsoft Word file is created with the name of *zaffar* in *TC \ BIN* folder.